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WP 2002-27

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# Private School Location and Neighborhood Characteristics

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December 2002

I would like to thank Daniel Sullivan, Joseph Altonji, and seminar participants at Cornell University, the Federal Reserve Bank of Chicago, and University of Albany for helpful comments. I am also grateful to Erin Krupka for research assistance. The views expressed in this paper are the views of the author and are not necessarily the views of the Federal Reserve Bank of Chicago or the Federal Reserve System. I take full responsibility for any errors.

Publicly funded elementary and secondary education has played an important role throughout much of United States history in ensuring that the U.S. population is among the most educated in the world. (See Goldin (1999) for a brief history of education in the United States.) At the same time, privately funded elementary and secondary schools have steadily coexisted, largely giving parents the opportunity to provide their children with a religious education in a country believing in the importance of the separation of church and State. In 1900, 8 percent of students enrolled in grades kindergarten to grade 12 were enrolled in private schools while today roughly 11 percent of children are enrolled in private school. The percent enrolled in private school has remained relatively constant over the 1990s; however, private school enrollment rates have been higher in the intervening years, reaching nearly 14 percent in the late 1950s and early 1960s and reaching nearly 13 percent in the 1980s (*Digest of Education Statistics, 2000*). Adoption of current public school reform proposals, particularly the idea of providing parents with education vouchers, is likely to lead to an increase in private school enrollment or at least an increase in enrollment at schools traditionally defined as private with a blurring of the distinction between public and private schools due to the public source of the voucher financing.

Universal and limited education vouchers have played a role in the public school reform debate for many years. The strongest proponents argue that while one may justify the role of the government in financing education, one cannot justify the role of the government in running the schools. More generally, proponents of education vouchers believe that vouchers are a way to increase the competition schools face by enabling parents to choose among alternative public schools as well as enabling more parents to send their children to private schools. The increase in competition is expected to increase public and private school quality as individual schools

compete for students. Subsequently, if private schools are more efficient at providing quality education than public schools, then one would expect to see a shift under a universal voucher program from publicly financed public education to publicly and privately financed private education.

Any voucher program that is going to have a major impact on the public education system is likely to require an expansion of private schools in order to accommodate increased demand; however, very little is known about where private schools open and therefore how a major voucher program might affect private school availability in various communities. The goal of this paper is to examine the relationship between the location of private schools and the local public school and neighborhood characteristics such as public school test score performance and average household income. To the extent that private schools respond to area characteristics in their location decisions, I hope to shed some light on how changes in the demand for private schooling, arising from an education voucher program, might change the private school composition of local markets. Using data from Illinois, I examine the relationship between the number of private schools in a zip code and the characteristics of the public schools and population of the zip code. I find statistically significant positive relationships between the number of private schools in 1998 and average 3$^{rd}$ grade class size in the public schools, the percent of the population that is college educated and the percent of persons over 55 years of age. In addition, I find significant negative relationships between the number of private schools and average household income of the community and an index of racial concentration.

The paper also includes some extensions to the basic results in which I examine private non-religious, non-Catholic religious, and Catholic schools separately as well as look more

specifically at private school entry. Not surprisingly, some differences exist in the relationships between private non-religious, non-Catholic religious, and Catholic school counts and their community characteristics. Looking at private school entry, many of the results are similar to those relying only on the more recent data and current counts of private schools; however, areas with larger increases in the school-aged population had less entry on average, and areas with increasing income dispersion experienced greater entry.

**II. Previous research**

Much of the previous research on private schools has focused on the effect of private schools on public school quality, the relative quality of private and public schools, and the determinants of private school attendance rather than the supply-side of private school provision. For example, Hoxby (1994) examines the effect of private school competition on public school quality and finds that where public schools face greater competition from private schools, the public school students experience greater educational attainment, higher graduation rates, and higher future wages. Sander (1996) and Neal (1997) look at the effect of Catholic school attendance–elementary and secondary, respectively–on various measures of achievement and find some positive effects of Catholic school attendance relative to public school attendance. At the same time, Catholic school attendance was found to have a negligible effect on suburban students' achievement (Neal (1997)) and science test scores (Sander (1996)). Several other studies examine the determinants of private school enrollment looking both at socioeconomic characteristics of the family associated with private school attendance such as income and education as well as the influence of public school characteristics such as public school quality, public school finance, or the degree of public school choice. See Clotfelter (1976), Long and

Toma (1988), Schmidt (1992), and Downes (1996) for several examples.

Among the empirical work looking at private schools, Downes and Greenstein (1996) is a notable exception in looking more specifically at the supply-side decisions of private schools. Similar to the goals of this paper, Downes and Greenstein (1996) examine the relationship between counts of private schools and public school and population characteristics of the location. Instead of Illinois zip codes, their study uses school districts in California in 1979 as the area unit of observation. The authors find statistically significant, positive relationships between number of private schools and the public school pupil-teacher ratio (as a measure of public school quality), the percent of public school students on AFDC, and the percent of public school 6$^{th}$ graders with limited English proficiency (LEP). They find that the number of private schools is positively related to the percent of the adult population who are high school graduates, the percent of adults who are college graduates, the percent of students who are Hispanic, and the percent of students who are Asian. They find no relationship between the number of private schools and mean family income.

One advantage of the current study over Downes and Greenstein (1996) is that Illinois public schools provide information on average class sizes and standardized test scores, additional school quality measures to pupil-teacher ratio and expenditure per pupil measures that are often used as proxies for school quality. Neither class-size nor standardized test scores are ideal measures of school quality because they confound measures of both peer and school quality. That said, they may well reflect perceived school quality by parents which may be a more important measure of school quality from the perspective of a private school competitor. Additionally, I have matched private school data over time in order to explore the relationships between private

school entry and exit and the local public school and location characteristics.

**III. Data and descriptive statistics**

Information on private schools in Illinois comes from the National Center for Education Statistics, Private School Universe Survey, 1997-98. From these data, I identify the zip code location as well as religious affiliation and grade level for each private school. I eliminate schools located in zero population zip codes and those schools for which the program is ungraded or for which kindergarten is the highest grade offered. The breakdown of private school affiliation is presented in Figures 1 and 2 while descriptive statistics for the private schools are presented in Table 1, panel A.

In 1998 1157 private schools existed in Illinois.[1] One-half of the private schools are Catholic (51 percent), and roughly 10 percent are nonsectarian (See Figure 1.). These affiliation percentages are not weighted by enrollment, however, and when looking at the enrollment-weighted shares in Figure 2, the Catholic schools are much larger on average than other private school types. Over two-thirds of the private school enrollment is in Catholic schools, while only 5.5 percent of the enrollment is in nonsectarian schools. Compared to national statistics, private schools in Illinois are much more likely to be Catholic and are less likely to be nonsectarian. Nationally, roughly 30 percent of private schools are Roman Catholic and 22 percent are non-sectarian while 50 percent of private school students are enrolled at Roman Catholic schools and 16 percent are enrolled in non-sectarian schools.[2]

The average private school in Illinois has 243 students, 72 percent of whom are white, 15

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[1]All included schools have a "graded" program and a highest grade of 2nd or higher.

[2]U.S. Department of Education (1999).

percent of whom are African-American, and 9 percent of whom are Hispanic (see Table 1). The average pupil-teacher ratio is 16.0, and the majority of private schools have elementary grades, 75 percent, while 10 percent offer only secondary grade levels. Similar characteristics for public schools in Illinois are presented in Panel B of Table 1. In comparison, the public schools are much larger on average, 508 students, and somewhat less white with an average of 70 percent of the students being white, 18 percent African-American, and 9 percent Hispanic. The average student-teacher ratio is higher in the public schools at 17.3 pupils per teacher. Note that the Table 1 statistics are not weighted by school size and therefore reflect the characteristics of the average school rather than reflecting the characteristics of the school experienced by the average public or private school student. Also, descriptive data are unavailable for 14 of the private schools known to be in existence in 1998.

In order to examine the relationship between the number of private schools and local area characteristics, the data are combined into zip code-level observations. For each zip code, I construct the count of private schools in the zip code, the number of private schools existing in 1998 that did not exist in 1980 (defined as entry), the number of private schools that exist in 1980 and no longer exist in 1998 (defined as exit), average public school characteristics in the zip code using 1998 school report card data, the 1990 to 1998 change in zip code average public school report card characteristics, average 1990 Census characteristics of persons in the zip code, and the 1980 to 1990 change in Census zip code characteristics.

Summary statistics for the zip codes are presented in Table 2 for the 1236 of 1240 zip codes in Illinois used in the following analysis. The four excluded zip codes have zero population in 1990. Each zip code has an average of 0.92 private schools, usually with some

religious affiliation. The zip code public schools have an average third-grade class size of 21.6 with average third-grade Illinois Goal Assessment Program (IGAP) math scores ranging from 174 to 431 and reading scores ranging from 142 to 356, both out of a possible 500 points. The average Illinois zip code has 25 percent of persons 25 years and older having less than a high school diploma and 14 percent having at least a bachelor's degree. Average household income is $45,078 in real 1999 dollars, and the constructed measure of the standard deviation of household income is nearly $37,000 in real 1999 dollars. The average zip code has only 0.84 percent of the population that is limited English proficient as defined by the U.S. Census; however, in some zip codes more than 20 percent of persons are LEP. To measure race concentration, I construct a Herfindahl-Hirschman Index (HHI) of race shares using the categories defined in the Census–white, black, Asian, Native American, and other. The HHI for race will range from 0.2 to 1 where an HHI of 0.2 would represent a community with equal shares of all races. The average Illinois zipcode has a race HHI of 0.92. The race breakdown for the average zipcode would be 94 percent white, 4 percent African-American, and less than 1 percent Asian. Roughly 2 percent of the population is Hispanic. 24 percent of the zip code population is over 55 years of age on average, while 19 percent falls in the school-aged range of 5 to 17 years of age. Finally zip code school-aged population averages 1,702 people.

**IV. Private school location and neighborhood characteristics**

Although little is understood about how private schools make location decisions, a reasonable starting point is to hypothesize that private schools generally choose to locate where there is demand for private schooling. Therefore, it is useful to consider characteristics likely to affect demand for private schooling. Most obviously, one would expect to see more private

schools in areas with a larger school-aged population because greater population, all else equal, is likely to be associated with greater numbers of students desiring enrollment in private schools. Considering the role of public schools in the private school/public school choice, on the one hand, one might expect poor quality public schools to be associated with greater numbers of private schools as the value of the net increase in school quality from switching to private school exceeds the cost of the private schooling. On the other hand, to the extent that private schools provide competition for public schools as suggested in some of the education literature, greater numbers of private schools may be associated with better performing public schools.

Following previous research, demographic characteristics of the zip code population may also be correlated with demand for private schooling and hence numbers of private schools. For example, Hispanics are on average more likely to be Catholic and therefore are likely to have a greater preference for Catholic education. In addition, people may prefer that their children attend school with other children of their same race which might lead to racial segregation between private and public schools. If this is the case, one would expect to see greater numbers of private schools in communities with lower race HHIs (greater racial diversity). Finally, education and income characteristics of the community may also be associated with differences in demand for private schools. Higher education may be correlated with greater preference for higher quality education than is offered in the public schools. Alternatively, education is positively correlated with income which is likely to be correlated with greater demand for quality education so both education and income are expected to be associated with demand for private schooling. Lastly, Tiebout sorting (the sorting of households into communities with similar public good preferences) or rather the lack of Tiebout sorting may also relate to the demand for

private education. If households with very different demands for quality education live in the same community, one might expect greater demand for private schools in order for the different demands to be met. In particular, assuming household income is positively correlated with demand for quality schools, communities with large disparities in household income may have greater demand for private schools as households sort into public and private schooling based on their different demands for quality education.

**A. Correlations**

For a first look at the relationship between numbers of private schools and public school quality and neighborhood characteristics, Table 3 presents simple correlation coefficients along with p-values for the correlations between the count of private schools and various zip code characteristics that might influence private school location (column (1)). Columns (2), (3), and (4) present similar correlations between the zip code characteristics and the counts of non-religious, non-Catholic religious, and Catholic schools. As expected, the number of private schools is positively correlated with the number of school-aged children, i.e., generally speaking, communities with greater numbers of school-aged children also have more private schools. The school quality measures are correlated with the counts of private schools in the negative directions, i.e. higher public school quality is associated with lower numbers of private schools. Smaller third-grade class sizes (often assumed to reflect higher school quality) are associated with fewer total private schools, and there are fewer private schools in communities with higher average third-grade math and reading IGAP scores.

Looking at race and ethnicity, communities that are more racially diverse or have a higher share of Hispanic population have greater numbers of private schools. Also, areas in which

larger shares of the population are college graduates are associated with more private schools, while communities with a greater share of the population over the age of 55 have fewer private schools. Finally, higher average household income, greater dispersion in household income as measured by the standard deviation of household income, greater population density, and location in the Chicago metropolitan statistical area (MSA) are all associated with more private schools.

**B. Results from Poisson regression**

The correlation results above provide bivariate descriptions of the data, but they do not let us consider more complex, multivariate relationships that may paint a somewhat different picture of private school location due to correlations between the covariates themselves as well as between the covariates and counts of private schools. The results below utilize Poisson regression analysis in order to consider these more complex relationships in the data. In particular, it will be important to be able to distinguish the relationship between school-aged population and expected number of private schools from other characteristics such as racial diversity and ethnicity that are correlated with population due to differences in characteristics between urban Chicago zip codes and more rural Illinois zip codes.

The number of private schools in a zip code is assumed to have a Poisson distribution with parameter $\lambda_i$, where *i* indexes the zip code. $\lambda_i$ is the expected number of private schools in a zip code. The probability that the number of private schools in zip code *i*, denoted $Y_i$, equals *y* can be written as follows:

$$\Pr(Y_i = y) = \exp(-\lambda_i)\frac{(\lambda_i)^y}{y!} \quad (1)$$

$\lambda_i$ is then parameterized by specifying that the natural logarithm of $\lambda_i$ is a linear function of the explanatory variables, *i.e.*,

$$\ln \lambda_i = \alpha + \sum_{j=1}^{J} \beta_j x_{ij} \quad (2)$$

$\alpha$ and the $\beta_j$ are parameters to be estimated using maximum likelihood estimation. Throughout the paper, I report results for the estimates of the $\beta_j$ without reporting the estimates of $\alpha$.

The results in sub-section 1 focus on the relationship between total counts of private schools and community characteristics. Interesting differences between non-religious, non-Catholic religious, and Catholic private school counts and community characteristics are highlighted in sub-section 2, and the results in sub-section 3 consider the more difficult question of how private school entry is related to location characteristics and changes in location characteristics over time.

**1. Counts of private schools**

Estimation results from Poisson regression of the counts of private schools on the logarithm of the school-aged population and various school quality measures are presented in Table 4. With the exception of the school-aged population coefficient, coefficient estimates can be interpreted as the proportion change in the expected number of private schools associated with a one unit change in the variable of interest. The school-aged population coefficient reflects the percentage change in private schools associated with a one percent change in the school-aged population. Since the number of private schools is expected to be highly related to the size of the market, i.e. the population of school-aged children, all estimates control for the logarithm of the number of school-aged persons and population density. All estimates also include an indicator

variable for the zipcode being located in the Chicago Metropolitan Statistical Area (MSA). Column (1) of Table 4 includes no public school quality measure while the remaining specifications in Table 4 consider 3 alternative measures of public school quality–average class size and average math and reading IGAP scores.

Looking at the school-aged population result, communities with one percent larger school-aged populations have 1.1 percent more private schools on average. If the share of school-aged children attending public school is unrelated to the number of school-aged children in the zip code, then a school-aged population coefficient estimate greater than one indicates that larger communities have smaller private schools on average. That said, in Illinois there is a positive relationship between the number of school-aged children and the percent of children enrolled in private school pushing this relationship in the opposite direction. Thus, nothing definitive can be said about the relationship between school-aged population and average school size. Throughout the specifications in Tables 4 to 7, the school-aged population coefficient estimate ranges from 1.07 to 1.20 and is statistically different from one at the 5 percent level of significance about one-half of the time.

Among the school quality proxy measures, only average 3rd grade class size has a statistically significant relationship with the total number of private schools. Areas with an average of one more child per 3rd grade class have an expected 4 percent more private schools. Average 3rd grade math and reading scores are unrelated to the number of private schools. The lack of a strong relationship for all of the school quality measures is not altogether surprising given that the expected direction of the relationship between private schools and public school quality is uncertain. However, from a public policy standpoint, it is significant that there is an

apparent relationship between private school location and public school class size.

Turning to the results for the other neighborhood characteristics, I find that education, income, race concentration, and age have consistently significant relationships with the number of private schools. Areas in which a greater share of the population has at least a Bachelor's degree have more private schools. A 1 percentage point increase in the population with a Bachelor's degree increases the expected number of private schools by 1.5 percent. In contrast, wealthier areas, measured by average household income, have fewer private schools on average. A $10,000 increase in average household income decreases the expected number of private schools by between 10 and 11 percent. Interestingly, the dispersion of household income in an area is generally unrelated to the total number of private schools. In contrast, there is a positive and statistically significant relationship between racial dispersion and total number of private schools. Areas that are more racially diverse, *i.e.* have a lower race concentration measure, have greater numbers of private schools. A one standard decline in the race HHI is associated with roughly a 5 percent increase in the expected number of private schools. Finally, the percent of the population over 55 years of age is highly related to the number of private schools with areas with older populations having more private schools on average. Specifically, a 1 percentage point increase in the percent of the population over 55 years of age is associated with a 5 percent increase in the expected number of private schools.

The results in Table 4 pool counts of all types of private schools–non-religious, Catholic, Lutheran, etc.–together. Because different types of private schools may serve somewhat different populations and therefore tend to locate in different types of neighborhoods, Tables 5 through 7 examine the relationships between counts of three categories of private schools and

neighborhood characteristics. The three types of private schools examined are: non-religious, non-Catholic religious (other religious), and Catholic schools.

**2. Private schools by type: non-religious, other religious, and Catholic**

Generally speaking, private schools may be viewed to distinguish themselves on two dimensions: academic quality and religion. As such, religious school location decisions may be very different than the location decisions of non-religious schools. For example, one might think that schools offering no religious affiliation may be more responsive to public school quality. Similarly, Catholic schools may tend to locate in areas with larger Catholic populations, e.g. areas with larger Hispanic populations. Because such a large share of the private schools are Catholic, I am also able to examine Catholic school locations separately from all other religious schools. The results presented in Tables 5, 6, and 7 provide separate estimates for the relationship between counts of non-religious, other religious, and Catholic schools with select location characteristics.

Once again, the logarithm of the number of school-aged persons in the zip code is controlled for in each specification along with population density and the Chicago MSA indicator. Catholic school counts and to some extent non-religious private school counts are significantly higher in Chicago MSA zip codes. Other religious school counts are not statistically different inside and outside the Chicago MSA. Generally, population density is unrelated to private school counts by type; however, there is a significant, negative relationship between population density and other religious school counts for two of the four specifications.

Turning to the school quality results, average 3$^{rd}$ grade class size is unrelated to the

number of private, non-religious schools but has a positive, statistically significant association with the number of other religious and Catholic private schools. A one-student decrease in the average public school 3rd grade class is associated with a 4.9 percent decrease in the number of non-Catholic religious schools. The relationship is somewhat smaller for Catholic schools, but the same decrease in average class size is associated with a 3.4 percent decrease in the number of Catholic schools. This result is consistent with the idea that religious schools offer a somewhat more disciplined environment in addition to the religious education. If larger class sizes lead to a more disruptive, less disciplined class room as described by Lazear (2001), parents in communities with larger public school class sizes may have greater demand for private, religious schools. In contrast, the test score measures have statistically significant, negative relationships with the number of non-religious private schools at the 5 percent level of significance. For other religious and Catholic schools the test score measures are positively related to counts of private schools; however, the relationship is only statistically significant for Catholic schools and average 3rd grade math scores and it is only significant at the 10 percent level. A one standard deviation increase in average public school math test scores is associated with a 37 percent decline in the expected number of private, non-religious schools. Similarly, a one standard deviation increase in average public school reading test scores is associated with a 43 percent decline in the expected number of non-religious schools.

Comparing non-religious schools to religious schools generally, the relationship with the share of the population over 55 years of age is strikingly different. Compared to non-religious schools, both Catholic and non-Catholic religious schools are more likely to be located in areas with a higher share of the population over 55 years of age. A 1 percentage point increase in the

population over 55 years of age is associated with a 3.5 percent increase in the expected number of other religious schools and a 7 percent increase in the expected number of Catholic schools.

Interesting differences also arise when comparing the results for Catholic and other religious schools. Catholic schools are more like non-religious schools in that there is a positive relationship between the percent of the population with at least a Bachelor's degree and the expected number of schools. That said, the relationship for Catholic schools is only statistically significant for two of the specifications. For Catholic schools a one percentage point increase in the percent of adults with a B.A. or more education is associated with a 1 percent increase in the expected number of schools. For non-religious schools the relationship is stronger with a one percentage point increase in the percent of adults with a B.A. being associated with a 4 to 8 percent increase in the expected number of schools.

Non-Catholic religious private school counts have several more statistically significant relationships with community characteristics than either non-religious or Catholic schools. First, other religious school counts are significantly related to average household income and income dispersion in the community. A $10,000 increase in average household income is associated with a 16 percent decrease in the number of non-Catholic religious schools. In addition, an increase in the income dispersion as measured by the standard deviation of household income is associated with an increase in the number of other religious schools. The count of other religious private schools is also statistically related to the measure of racial dispersion. A one standard deviation decrease in the race HHI (an increase in racial dispersion) is associated with a 10 to 13 percent increase in the expected number of other religious schools.

**3. Private School Entry**

There are at least two reasons why one might be skeptical of the relevance of the above results. First, the relationships between school counts and area characteristics, other than school quality, are based on private school locations in 1998 and Census data for 1990. Second, current counts of private schools by location may be based largely on past location decisions. An alternative approach is to examine the relationships between private school entry and changes in location characteristics. I do this by matching private schools in 1980 with private schools in 1998 to determine how many schools have entered the community on aggregate over the eighteen years. The results presented in the next tables look at the relationships between counts of private school entry and changes in public school characteristics between 1990 and 1998 and changes in location characteristics from 1980 to 1990.

In table 8 I present separate estimates by type of private school–all private, non-religious, other religious, and Catholic–in columns 1 through 4, respectively. In each specification I control for the total private school count in 1980, the logarithm of the school-aged population in 1990, the change in the logarithm of the school-aged population between 1980 and 1990, the change in average 3rd grade class size from 1990 to 1998, the Chicago MSA indicator variable and the changes from 1980 to 1990 for each of the following: percent of persons with a B.A. degree or higher, average household income, standard deviation of household income, percent of persons with limited English proficiency, race concentration, share of the population who are Hispanic, and percent of the population over 55 years of age.[3] The change in the population density is

[3]The results are substantially unchanged when using 1980 counts of the number of private schools of a particular type instead of counts of the total number of private schools.

omitted because land area does not change over time for the areas as defined and thus essentially reflects changes in population. The coefficient estimates from separate regressions using the average test score data are reported in Table 9.

Somewhat surprisingly, the number of private schools in 1980 has little relationship to private school entry between 1980 and 1998. Also, after controlling for the logarithm of the school-aged population in 1990, population growth is unrelated to the number of entrants in expectation. While controlling for the school-aged population and the growth in the school-aged population, zip codes in the Chicago MSA still have some significant differences in the entry. Overall the effect is positive; however, the expected number of non-religious school entrants is significantly higher in the Chicago MSA while the number of other religious entrants is significantly lower in the Chicago MSA. For non-religious private schools, entry counts are roughly 95 percent higher in the Chicago MSA. Zip codes in the Chicago MSA have an expected 52 percent fewer other religious school entry counts.

Looking at school quality, the results continue to suggest a positive relationship between private school counts and average 3$^{rd}$ grade class size in the public schools. A one-student increase in average 3$^{rd}$ grade class size is associated with a 3 percent increase in the expected number of private school entrants. When entry is broken down by private school type, the coefficient estimates are all positive although none are statistically significant. Coefficient estimates from similar specifications for public school math and reading scores are presented in Table 9. The coefficient estimates are generally negative suggesting that increasing private school quality is associated with fewer private school entries. Once again, the coefficient estimates are statistically significant for both math and reading scores for non-religious school

entry counts but unrelated to entry counts for other religious and Catholic schools.

Turning to the Census characteristics, a $10,000 increase in average household income is associated with an expected 14 percent fewer private school entries between 1980 and 1998. In addition, a $10,000 increase in the standard deviation of household income in the community is associated with 22 percent more entry of private schools. The coefficient estimates for income range from -0.12 to -0.20 when broken down by private school entry type, but none are statistically significant at conventional levels. Similarly, the coefficient estimates for income standard deviation range from 0.16 to 0.23 when broken down by private school entry type. The coefficient estimate for other religious school entry is also statistically significant.

Overall private school entry as well as non-religious and other religious school entry are positively related to increases in the percent of the population that is limited English proficient. A 1 percentage point increase in the share of population with limited English proficiency is associated with roughly a 20 percent increase in private school entry.

Increases in race concentration (increases in the race HHI) are generally negatively related to private school entry although the number of Catholic school entrants is positively related to increases race homogeneity. In contrast with the previous estimates, changes in the share of the population who are Hispanic has a statistically significant relationship with private school entry. A 1 percentage point increase in the Hispanic population is associated with a 9 percent decline in private school entry, a 9 percent decline in non-religious school entry, and a 12 percent decline in other religious school entry. However, there is no relationship between changes in Hispanic population and entry of Catholic schools.

Finally, unlike in the private school count regressions, the population over 55 years of age

is generally not related to counts of private school entry. The exception is other religious schools for which entry is negatively associated with growth in the older population. A 1 percentage point increase in the population over 55 is associated with 5 percent lower expected other religious school entry. This result suggests that the earlier positive relationship between share of the population over 55 and numbers of private religious schools may result primarily from past location decisions; whereas entry may reflect current demand.

## VI. Conclusion

The results above reveal some interesting relationships between private school location and neighborhood characteristics. In particular, the relationship between number of private schools entrants and household income dispersion in the community is consistent with predictions and somewhat different from the findings of Downes and Greenstein (1996) which does not include a measure of community heterogeneity. Zip code neighborhoods in which households are increasingly less well sorted by income, i.e. zip codes with increasing income dispersion, have more private school entry on average than neighborhoods with less increase in income dispersion. This is consistent with expectations that households with similar income levels will have similar demands for education quality, and thus neighborhoods with greater income homogeneity will have less demand for private schooling and therefore fewer private schools. The finding that increases in racial diversity are also associated with greater private school entry provides further evidence that community homogeneity is associated with less demand for private schools.

The entry results are likely more useful for thinking about how a universal voucher

program might change the private school composition of various neighborhoods. However, in this study I do not actually observe the effect of introducing education vouchers. That said, if one thinks of a education voucher as increasing demand for private schooling, one can consider which neighborhoods are likely to have relatively easy access to private school options. The race and income standard deviation results suggest that children living in more heterogenous neighborhoods are more likely to have private school access and to get more private school entry. This is of course a strong conclusion to draw. In particular, there are other dimensions of private school supply, namely increasing enrollment and offering more grade levels, that are not captured by measures of entry. These are likely to be dimensions on which schools may respond more easily to changes in private school demand. Thus, future work might be helped by capturing several dimensions of increasing private school supply. In addition, case studies of areas such as Milwaukee and Chile where educational vouchers have been implemented might reveal even more information on this question.

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**Table 1**
**Descriptive Statistics of Illinois MSA Private and Public Schools**

| | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|
| Private Schools | | | | |
| Enrollment | 242.59 | 229.79 | 3 | 2050 |
| Percent of enrollment that is white | 72.26 | 34.21 | 0 | 100 |
| Percent of enrollment that is African-American | 15.17 | 29.45 | 0 | 100 |
| Percent of enrollment that is Asian | 3.12 | 8.72 | 0 | 100 |
| Percent of enrollment that is Hispanic | 9.28 | 19.00 | 0 | 99.15 |
| Student-teacher ratio | 16.03 | 10.99 | 1.68 | 289.14 |
| Percent of schools that are elementary | 75.42 | | | |
| Percent of schools that are secondary | 10.32 | | | |
| Percent of schools that are coeducational | 95.36 | | | |
| Percent of schools that are all-female | 2.27 | | | |
| Number of schools | 1143 | | | |
| Public Schools | | | | |
| Enrollment | 508.08 | 417.22 | 24 | 4217 |
| Percent of enrollment that is white | 69.84 | 35.17 | 0 | 100 |
| Percent of enrollment that is African-American | 17.58 | 30.70 | 0 | 100 |
| Percent of enrollment that is Asian | 2.03 | 4.80 | 0 | 58 |
| Percent of enrollment that is Hispanic | 9.06 | 19.13 | 0 | 100 |
| Student-teacher ratio | 17.28 | 3.79 | 4.90 | 62.70 |
| Average 3rd grade class size | 22.67 | 4.51 | 5 | 44 |
| Percent of schools that are elementary | 66.99 | | | |
| Percent of schools that are secondary | 17.00 | | | |
| Number of schools | 3829 | | | |

Notes: All means are unweighted. The student-teacher ratio is missing for 12 public schools due to missing data on full-time equivalent (fte) classroom teachers. For school level, the omitted categories are junior high and combined elementary and secondary. None of the public schools fall into the "combined" category. Elementary schools are defined as having a low grade from pre-kindergarten to 6th grade and a high grade from 1st to 9th grade. Secondary schools are defined as having a low grade between 5th and 10th grade and a high grade between 10th and 12th grade.

**Table 2**
**Descriptive Statistics of Illinois Zip Codes**

| | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|
| Number of private schools | 0.92 | 1.95 | 0 | 16 |
| Number of private non-religious schools | 0.10 | 0.39 | 0 | 4 |
| Number of religious, non-Catholic schools | 0.35 | 0.89 | 0 | 10 |
| Number of Catholic schools | 0.48 | 1.13 | 0 | 9 |
| # of private schools entering | 0.56 | 1.35 | 0 | 14 |
| # of private schools exiting | 0.31 | 0.99 | 0 | 10 |
| # of private, non-religious schools entering | 0.31 | 0.93 | 0 | 10 |
| # of private, non-religious schools exiting | 0.10 | 0.43 | 0 | 4 |
| # of religious, non-Catholic schools entering | 0.22 | 0.61 | 0 | 7 |
| # of religious, non-Catholic schools exiting | 0.07 | 0.29 | 0 | 3 |
| # of Catholic schools entering | 0.02 | 0.16 | 0 | 2 |
| # of Catholic schools exiting | 0.13 | 0.63 | 0 | 9 |
| Average 3rd grade class size in the public schools | 21.63 | 3.34 | 7 | 34 |
| Indicator=1 if zip code is missing 3rd grade class size | 0.32 | 0.46 | 0 | 1 |
| Average 3rd grade IGAP math score[a] | 298 | 34 | 174 | 431 |
| Average 3rd grade IGAP reading score[a] | 260 | 31 | 142 | 356 |
| Indicator=1 if zip code missing 3rd grade IGAP scores | 0.32 | 0.46 | 0 | 1 |
| Number of school-aged children | 1,702 | 3,024 | 0 | 28,098 |
| Percent of persons with less than a high school diploma | 24.90 | 9.91 | 0 | 62.42 |
| Percent of persons with a bachelor's degree or higher | 13.87 | 11.81 | 0 | 89.29 |
| Average household income | 46,226 | 20,045 | 13,867 | 277,546 |
| Constructed standard deviation of household income | 3,659 | 1,597 | 33 | 14,000 |
| Indicator=1 if zip code is missing income data | 0.002 | 0.04 | 0 | 1 |
| Percent of persons with limited English proficiency | 0.84 | 2.09 | 0 | 22.33 |
| Race concentration | 0.92 | 0.13 | 0.33 | 1.00 |
| Percent of persons who are Hispanic | 2.16 | 5.70 | 0 | 67.27 |
| Percent of persons over 55 years of age | 23.82 | 7.01 | 0 | 70.42 |

| | | | | |
|---|---|---|---|---|
| Population density | 475.15 | 1373.83 | 0.75 | 14069 |

Notes: There are 1236 observations. All means are unweighted. All dollar values are in 1999 dollars.
[a]The IGAP scores are reported on a 0 to 500 scale. The state averages of the individual IGAP scores in 1998 are 287 in 3rd grade math and 246 in 3rd grade reading.

**Table 3**
**Correlations Between Number of Private Schools and Select Characteristics of the Zip Code Public Schools and Population**

| | Number of private schools | Number of non-religious private schools | Number of non-Catholic religious private schools | Number of Catholic schools |
|---|---|---|---|---|
| School-aged population | 0.8027<br>(0.0000) | 0.4933<br>(0.0000) | 0.5642<br>(0.0000) | 0.7671<br>(0.0000) |
| Average 3rd grade class size | 0.2717<br>(0.0000) | 0.1449<br>(0.0000) | 0.2044<br>(0.0000) | 0.2568<br>(0.0000) |
| Average 3rd grade IGAP math score | -0.1590<br>(0.0000) | -0.1314<br>(0.0000) | -0.0950<br>(0.0008) | -0.1535<br>(0.0000) |
| Average 3rd grade IGAP reading score | -0.2325<br>(0.0000) | -0.1682<br>(0.0000) | -0.1431<br>(0.0000) | -0.2295<br>(0.0000) |
| Percent of persons with a bachelor's degree or higher | 0.2664<br>(0.0000) | 0.2907<br>(0.0000) | 0.1912<br>(0.0000) | 0.2076<br>(0.0000) |
| Average household income | 0.1732<br>(0.0000) | 0.1756<br>(0.0000) | 0.1200<br>(0.0000) | 0.1430<br>(0.0000) |
| Constructed standard deviation of household income | 0.2410<br>(0.0000) | 0.2254<br>(0.0000) | 0.1846<br>(0.0000) | 0.1917<br>(0.0000) |
| Percent of persons with limited English proficiency | 0.5075<br>(0.0000) | 0.3205<br>(0.0000) | 0.2739<br>(0.0000) | 0.5469<br>(0.0000) |
| Race concentration | -0.4962<br>(0.0000) | -0.3301<br>(0.0000) | -0.3454<br>(0.0000) | -0.4681<br>(0.0000) |
| Percent of population that is Hispanic | 0.4747<br>(0.0000) | 0.2948<br>(0.0000) | 0.2394<br>(0.0000) | 0.5266<br>(0.0000) |
| Percent of persons over 55 years of age | -0.1049<br>(0.0002) | -0.1355<br>(0.0000) | -0.0755<br>(0.0080) | -0.0744<br>(0.0089) |
| Population density | 0.5619<br>(0.0000) | 0.4891<br>(0.0000) | 0.3228<br>(0.0000) | 0.5439<br>(0.0000) |
| Chicago MSA | 0.4791<br>(0.0000) | 0.3565<br>(0.0000) | 0.2949<br>(0.0000) | 0.4692<br>(0.0000) |

Notes: There are 1236 observations. p-values are in parentheses. All dollar values are in 1999 dollars.

**Table 4**
**The relationship between number of private schools and public school and location characteristics estimated by Poisson regression**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Logarithm of school-aged population | 1.104<br>(0.041) | 1.066<br>(0.045) | 1.099<br>(0.044) | 1.094<br>(0.045) |
| Average 3rd grade class size in the public schools | | 0.037<br>(0.013) | | |
| Average 3rd grade math score | | | 0.001<br>(0.001) | |
| Average 3rd grade reading score | | | | 0.0001<br>(0.001) |
| % of population with a B.A. degree or higher | 0.013<br>(0.005) | 0.014<br>(0.005) | 0.011<br>(0.005) | 0.013<br>(0.005) |
| Average household income | -0.102<br>(0.052) | -0.111<br>(0.054) | -0.105<br>(0.053) | -0.103<br>(0.052) |
| Standard deviation of household income | 0.082<br>(0.063) | 0.106<br>(0.064) | 0.087<br>(0.063) | 0.084<br>(0.063) |
| % of population with limited English proficiency | 0.013<br>(0.033) | 0.011<br>(0.030) | 0.008<br>(0.034) | 0.013<br>(0.034) |
| Race concentration | -0.443<br>(0.240) | -0.462<br>(0.238) | -0.518<br>(0.262) | -0.454<br>(0.269) |
| Share Hispanic | -0.310<br>(1.137) | -0.088<br>(1.052) | -0.225<br>(1.146) | -0.288<br>(1.141) |
| % Over 55 years of age | 0.054<br>(0.006) | 0.054<br>(0.006) | 0.053<br>(0.006) | 0.053<br>(0.006) |
| Population density | -0.028<br>(0.023) | -0.035<br>(0.023) | -0.019<br>(0.025) | -0.027<br>(0.026) |
| Chicago MSA indicator | 0.141<br>(0.111) | 0.093<br>(0.111) | 0.139<br>(0.112) | 0.142<br>(0.111) |
| Log-likelihood | -956 | -952 | -956 | -956 |

Notes: Standard errors are in parentheses. The dependent variable is the number of private schools in the zip code in 1998. There are 1236 observations in each estimation. Each column also includes a dummy variable indicating that the logarithm of the school-aged population is missing and columns (2) through (4) include a dummy variable indicating whether the public school characteristic of interest is missing.

**Table 5**
**The relationship between number of private, non-religious schools and public school and location characteristics estimated by Poisson regression**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Logarithm of school-aged population | 1.201<br>(0.151) | 1.187<br>(0.154) | 1.109<br>(0.150) | 1.065<br>(0.145) |
| Average 3rd grade class size in the public schools | | -0.018<br>(0.041) | | |
| Average 3rd grade math score | | | -0.011<br>(0.004) | |
| Average 3rd grade reading score | | | | -0.014<br>(0.004) |
| % of population with a B.A. degree or higher | 0.042<br>(0.014) | 0.042<br>(0.014) | 0.065<br>(0.016) | 0.075<br>(0.017) |
| Average household income | -0.167<br>(0.174) | -0.166<br>(0.171) | -0.122<br>(0.138) | -0.112<br>(0.131) |
| Standard deviation of household income | 0.118<br>(0.200) | 0.111<br>(0.200) | 0.042<br>(0.186) | 0.004<br>(0.187) |
| % of population with limited English proficiency | -0.024<br>(0.058) | -0.023<br>(0.059) | 0.044<br>(0.066) | 0.048<br>(0.064) |
| Race concentration | -0.183<br>(0.738) | -0.149<br>(0.742) | 0.629<br>(0.732) | 0.877<br>(0.733) |
| Share Hispanic | 0.287<br>(1.981) | 0.236<br>(2.032) | -0.629<br>(2.144) | -0.366<br>(2.142) |
| % Over 55 years of age | 0.018<br>(0.022) | 0.017<br>(0.022) | 0.026<br>(0.021) | 0.027<br>(0.022) |
| Population density | 0.061<br>(0.054) | 0.066<br>(0.054) | -0.042<br>(0.071) | -0.071<br>(0.073) |
| Chicago MSA indicator | 0.574<br>(0.415) | 0.607<br>(0.421) | 0.682<br>(0.405) | 0.681<br>(0.390) |
| Log-likelihood | -236 | -236 | -232 | -230 |

Notes: See notes for Table 4.

**Table 6**
**The relationship between number of private non-Catholic religious schools and public school and location characteristics estimated by Poisson regression**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Logarithm of school-aged population | 1.072<br>(0.060) | 1.066<br>(0.068) | 1.109<br>(0.066) | 1.116<br>(0.067) |
| Average 3rd grade class size in the public schools | | 0.048<br>(0.021) | | |
| Average 3rd grade math score | | | 0.002<br>(0.002) | |
| Average 3rd grade reading score | | | | 0.002<br>(0.002) |
| % of population with a B.A. degree or higher | 0.001<br>(0.008) | 0.002<br>(0.008) | -0.003<br>(0.009) | -0.004<br>(0.009) |
| Average household income | -0.158<br>(0.070) | -0.168<br>(0.071) | -0.164<br>(0.071) | -0.166<br>(0.071) |
| Standard deviation of household income | 0.215<br>(0.091) | 0.235<br>(0.091) | 0.220<br>(0.090) | 0.223<br>(0.090) |
| % of population with limited English proficiency | 0.065<br>(0.084) | 0.062<br>(0.079) | 0.055<br>(0.086) | 0.055<br>(0.087) |
| Race concentration | -0.786<br>(0.439) | -0.793<br>(0.446) | -0.937<br>(0.478) | -0.989<br>(0.490) |
| Share Hispanic | -3.473<br>(3.052) | -3.210<br>(2.850) | -3.384<br>(3.054) | -3.438<br>(3.054) |
| % Over 55 years of age | 0.035<br>(0.010) | 0.037<br>(0.010) | 0.035<br>(0.010) | 0.035<br>(0.010) |
| Population density | -0.072<br>(0.045) | -0.085<br>(0.047) | -0.055<br>(0.050) | -0.049<br>(0.053) |
| Chicago MSA indicator | -0.138<br>(0.181) | -0.198<br>(0.185) | -0.151<br>(0.182) | -0.154<br>(0.183) |
| Log-likelihood | -670 | -667 | -669 | -669 |

Notes: See notes for Table 4.

**Table 7**
**The relationship between number of Catholic schools and public school and location characteristics estimated by Poisson regression**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Logarithm of school-aged population | 1.154<br>(0.057) | 1.085<br>(0.062) | 1.126<br>(0.060) | 1.122<br>(0.060) |
| Average 3rd grade class size in the public schools | | 0.034<br>(0.015) | | |
| Average 3rd grade math score | | | 0.002<br>(0.001) | |
| Average 3rd grade reading score | | | | 0.001<br>(0.002) |
| % of population with a B.A. degree or higher | 0.014<br>(0.007) | 0.014<br>(0.007) | 0.009<br>(0.007) | 0.011<br>(0.007) |
| Average household income | -0.034<br>(0.059) | -0.045<br>(0.060) | -0.039<br>(0.061) | -0.037<br>(0.061) |
| Standard deviation of household income | -0.041<br>(0.078) | -0.012<br>(0.078) | -0.029<br>(0.078) | -0.031<br>(0.079) |
| % of population with limited English proficiency | 0.002<br>(0.027) | -0.001<br>(0.026) | -0.012<br>(0.029) | -0.005<br>(0.029) |
| Race concentration | -0.249<br>(0.299) | -0.276<br>(0.298) | -0.448<br>(0.319) | -0.367<br>(0.324) |
| Share Hispanic | 0.992<br>(1.038) | 1.244<br>(1.046) | 1.225<br>(1.090) | 1.104<br>(1.073) |
| % Over 55 years of age | 0.074<br>(0.007) | 0.073<br>(0.007) | 0.071<br>(0.007) | 0.072<br>(0.007) |
| Population density | -0.040<br>(0.028) | -0.044<br>(0.027) | -0.016<br>(0.031) | -0.025<br>(0.032) |
| Chicago MSA indicator | 0.336<br>(0.135) | 0.295<br>(0.133) | 0.332<br>(0.136) | 0.336<br>(0.136) |
| Log-likelihood | -641 | -637 | -638 | -639 |

Notes: See notes for Table 4.

**Table 8**
**The relationship between entry and public school and location characteristics estimated by Poisson regression**

| | All private schools | Non-religious schools | Religious schools | |
|---|---|---|---|---|
| | | | Non-Catholic | Catholic |
| Number of private schools in 1980 | 0.016<br>(0.015) | 0.031<br>(0.019) | -0.018<br>(0.020) | -0.004<br>(0.048) |
| Logarithm of the 1990 school-aged population | 1.058<br>(0.073) | 1.021<br>(0.109) | 1.147<br>(0.086) | 1.269<br>(0.212) |
| 1980 to 1990 change in log school-aged population | -0.173<br>(0.142) | -0.200<br>(0.175) | -0.177<br>(0.213) | -1.425<br>(0.920) |
| 1990 to 1998 change in average public school 3rd grade class size | 0.033<br>(0.018) | 0.035<br>(0.025) | 0.027<br>(0.024) | 0.114<br>(0.076) |
| 1980 to 1990 change in percent of persons with a B.A. degree or higher | 0.028<br>(0.016) | 0.060<br>(0.020) | -0.006<br>(0.022) | 0.054<br>(0.072) |
| 1980 to 1990 change in average household income | -0.142<br>(0.076) | -0.118<br>(0.091) | -0.125<br>(0.108) | -0.203<br>(0.448) |
| 1980 to 1990 change in the standard deviation of HH income | 0.222<br>(0.088) | 0.164<br>(0.123) | 0.233<br>(0.120) | 0.167<br>(0.385) |
| 1980 to 1990 change in % of persons with limited English proficiency | 0.204<br>(0.075) | 0.200<br>(0.075) | 0.212<br>(0.115) | 0.234<br>(0.134) |
| 1980 to 1990 change in race concentration | -1.485<br>(0.748) | -1.892<br>(0.948) | -1.816<br>(1.091) | 5.990<br>(2.038) |
| 1980 to 1990 change in share of population that is Hispanic | -9.381<br>(3.027) | -8.878<br>(3.042) | -11.779<br>(4.583) | 4.421<br>(4.860) |
| 1980 to 1990 change in percent of population that is over 55 | -0.020<br>(0.019) | -0.003<br>(0.024) | -0.052<br>(0.022) | -0.072<br>(0.045) |
| Chicago MSA indicator | 0.221<br>(0.533) | 0.954<br>(0.242) | -0.524<br>(0.183) | 0.005<br>(0.670) |

Notes: The dependent variable is the count of private school entrants in each zip code between 1980 and 1998. Standard errors are in parentheses. There are 1236 zip codes in each estimation. In addition the specification includes the appropriate set of dummy variables indicating missing observations for Census and public school characteristics.

**Table 9**
**The relationship private school entry and public school and location characteristics estimated by Poisson regression**

| | All private schools | Non-religious schools | Religious schools | |
|---|---|---|---|---|
| | | | Non-Catholic | Catholic |
| 1990 to 1998 change in average public school 3rd grade math score | -0.003<br>(0.002) | -0.006<br>(0.003) | -0.001<br>(0.003) | 0.005<br>(0.010) |
| 1990 to 1998 change in average public school 3rd grade reading score | -0.003<br>(0.002) | -0.005<br>(0.003) | 0.0003<br>(0.003) | -0.009<br>(0.010) |

Notes: See Table 8. Math and reading coefficient estimates are obtained from specifications as in Table 8 but substituting average public school math or reading score for average 3rd grade class size.

**Figure 1**
**Illinois Private School Affiliations**

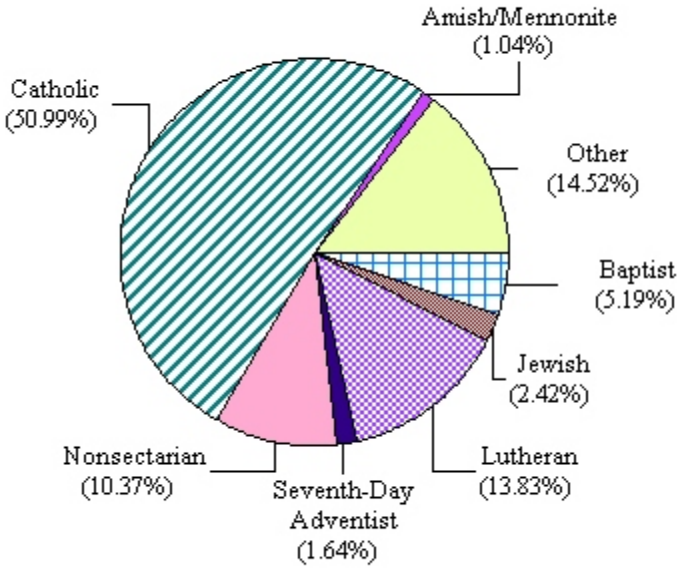
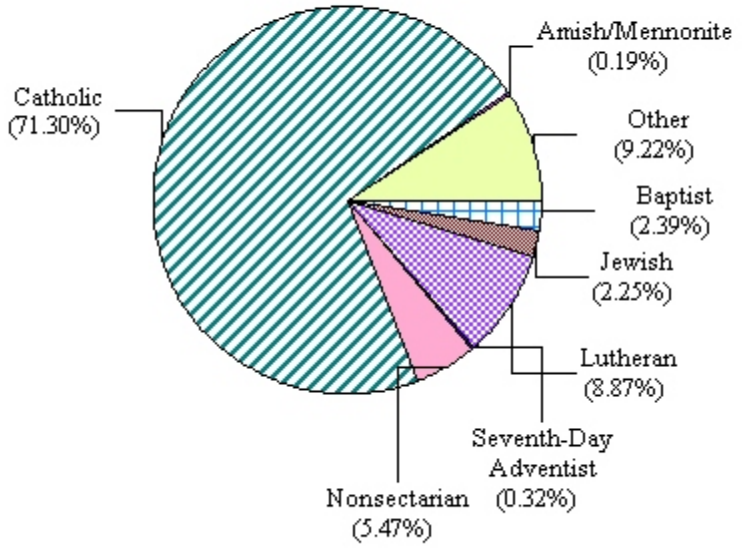



**Figure 2**
**Illinois Private School Affiliations Weighted by Enrollment**



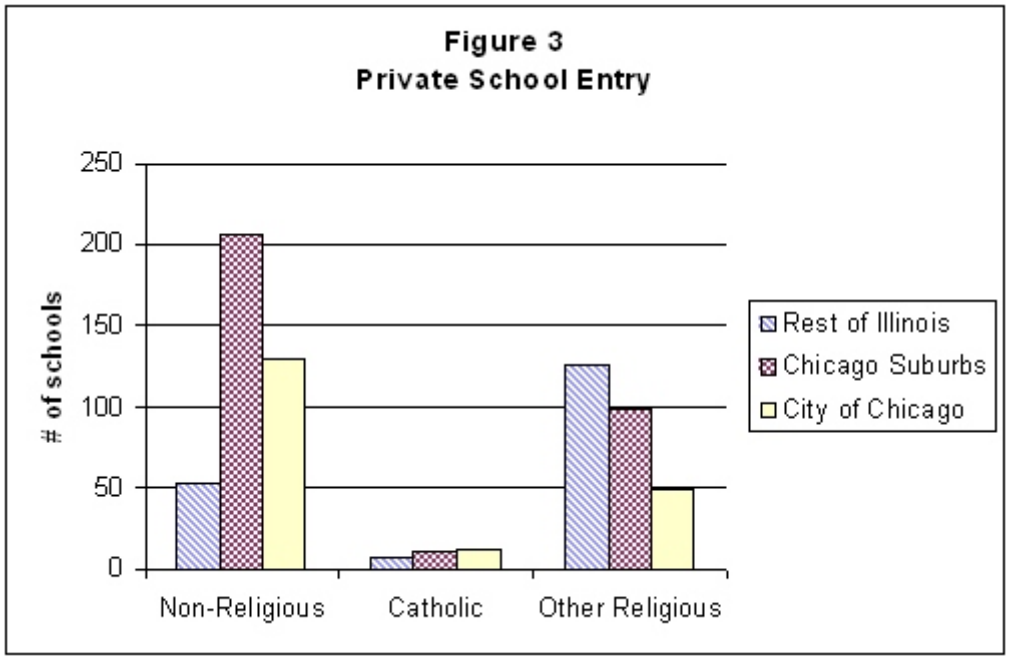


Figure 3
Private School Entry
250
200
150
100
50
0
# of schools
Non-Religious
Catholic
Other Religious
Rest of Illinois
Chicago Suburbs
City of Chicago

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